

Polarized Atomic Hydrogen Beam Tests in the Michigan Ultra-Cold Jet Target*

K. Yonehara, Z.B. Etienne, M.C. Kandes, K.J. Klein, A.D. Krisch, M.A. Leonova,
V.G. Luppov, V.S. Morozov, C.C. Peters, R.S. Raymond, D.E. Saam, D.L. Sisco,
D.R. Southworth

Randall Lab. of Physics, University of Michigan, Ann Arbor, MI - 48109-1120, USA

N.S. Borisov, V.V. Fimushkin

Joint Institute for Nuclear Research , RU-141980, Dubna, Russia

A.F. Prudkoglyad

Institute for High Energy Physics, RU-142284, Protvino, Russia

To study spin effects in high energy collisions, we are developing an ultra-cold high density jet target of proton-spin-polarized hydrogen atoms. The target uses a 12 Tesla magnetic field and a 0.3 K separation cell with a gold-coated polished parabolic mirror covered with super fluid helium-4 to produce a slow monochromatic beam of electron spin-polarized atomic hydrogen. An RF transition unit then converts it into a proton-spin polarized beam which is focused by a superconducting sextupole into the interaction region. The Jet produced, at the 1.4 mm by 11 mm detector slot, a spin-polarized atomic hydrogen beam with a measured intensity of about $2.2 \times 10^{15} \text{ H s}^{-1}$. This intensity corresponds to a free jet thickness (2 cm along an accelerator beam) of about $1.1 \times 10^{12} \text{ H cm}^{-2}$ with a proton polarization of about 50%. When the RF transition unit is installed, we expect a proton polarization higher than 90%. In recent tests, we studied beam properties and stability at different operating conditions and found stable operation at an average intensity of about $1.2 \times 10^{15} \text{ H s}^{-1}$ for at least 14 hours.

*Supported by a research grant from the U.S. Department of Energy.